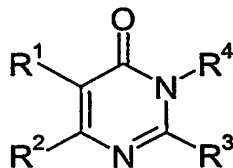


Claims

1. A compound having the chemical formula:



wherein:

R^1 and R^2 are either independently one of: H, halogen, CN, CF_3 , lower alkyl, cycloalk, and aryl; or R^1 and R^2 are together $-(CH_2)_n-$ and n is 5, 4, or 3;

R^3 is aryl group, which may have 1 to 4 substituents in the aryl ring and each substituent is one of: H, halogen, CN, CF_3 , OCF_3 , lower alkyl, $N(\text{lower alkyl})_2$, lower alkoxy, OH, $OC(O)\text{-lower alkyl}$, $OC(O)\text{-lower alkylamino}$, and $OC(O)\text{-lower alkyl-N(lower alkyl)}_2$;

R^4 is one of: H, lower alkyl, and a group of the formula $-(CH_2)_n-R^5$ wherein n is 0, 1, or 2, and R^5 is an aryl group which may have 1 to 3 substituents on the aryl ring and each substituent is one of: H, halogen, CN, CF_3 , OCF_3 , lower alkyl, lower alkoxy, $NH\text{-lower alkyl}$, $NH\text{-alkylaryl}$, $N(\text{lower alkyl})_2$, OH, $OC(O)\text{-lower alk}$, $OC(O)\text{-lower alkylamino}$, and $OC(O)\text{-lower alkyl-N(lower alk)}_2$;

and pharmaceutically acceptable salts or complexes.

2. The compound according to claim 1, wherein R^1 and R^2 are independently one of hydrogen and lower alkyl.

3. The compound according to claim 1, wherein R^1 and R^2 are together $-(CH_2)_n-$ and wherein n is 4 or 3.

4. The compound according to claim 2, wherein said lower alkyl is one of: methyl, ethyl and isopropyl.

5. The compound according to claim 1, wherein R^1 is one of ethyl and isopropyl.

6. The compound according to claim 1, wherein R² is methyl.
7. The compound according to claim 3, wherein R¹ and R² together are – (CH₂)₄–.
8. The compound according to claim 1, wherein R³ is phenyl optionally substituted with one of hydroxy or hydroxy and fluorine.
9. The compound according to claim 1, wherein R⁴ further comprises the group –(CH₂)_n– R⁵;
wherein n is 1 or 2;
and
R⁵ is phenyl optionally substituted with 1 or 2 halogens.
10. The compound according to claim 9, wherein n is 2 and said halogens are one of fluorine and chlorine.
11. The compound according to claim 1, wherein the compound is at least one of:
 - 2-(2-hydroxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;
 - 3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;
 - 3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;
 - 2-(2-hydroxy-phenyl)-5,6-dimethyl-3-phenethyl-3*H*-pyrimidin-4-one;
 - 3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;
 - 3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;
 - 3-[2-(4-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;
 - 5-ethyl-2-(2-hydroxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(4-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-5-propyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5-isopropyl-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5-isopropyl-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-5-methyl-3-phenethyl-6-trifluoromethyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-3-phenethyl-5,6,7,8-tetrahydro-3*H*-quinazolin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6,7,8-tetrahydro-3*H*-quinazolin-4-one;

5-cyclopropyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-3-phenethyl-3,5,6,7-tetrahydro-cyclopentapyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-3,5,6,7-tetrahydro-cyclopentapyrimidin-4-one;

5-ethyl-2-(2-methoxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-5-isopropyl-2-(2-methoxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(5-chloro-2-hydroxy-pyridin-3-yl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(3-fluoro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(5-fluoro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(2-fluoro-6-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

2-(5-chloro-2-hydroxy-phenyl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

2-(5-bromo-2-hydroxy-phenyl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-3-isopropyl-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(3,5-dibromo-2-hydroxy-phenyl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(3-chloro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-3-methyl-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(4-chloro-2-hydroxy-phenyl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-4-methoxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one.

12. The compound according to claim 1, wherein the compound is at least one of:

2-(2-hydroxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-5,6-dimethyl-3-phenethyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

3-[2-(4-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(2-hydroxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(4-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-5-propyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5-isopropyl-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5-isopropyl-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-5-methyl-3-phenethyl-6-trifluoromethyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-3-phenethyl-5,6,7,8-tetrahydro-3*H*-quinazolin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6,7,8-tetrahydro-3*H*-quinazolin-4-one;

5-cyclopropyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-3-phenethyl-3,5,6,7-tetrahydro-cyclopentapyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-3,5,6,7-tetrahydro-cyclopentapyrimidin-4-one;

5-ethyl-2-(2-methoxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;

2-(5-chloro-2-hydroxy-pyridin-3-yl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(3-fluoro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(5-fluoro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(2-fluoro-6-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

2-(5-bromo-2-hydroxy-phenyl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-3-isopropyl-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(3,5-dibromo-2-hydroxy-phenyl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one; and

2-(4-chloro-2-hydroxy-phenyl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one.

13. The compound according to claim 1, wherein the compound is at least one of:

2-(2-hydroxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-5,6-dimethyl-3-phenethyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

3-[2-(4-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(2-hydroxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(4-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-5-propyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5-isopropyl-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5-isopropyl-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-5-methyl-3-phenethyl-6-trifluoromethyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-3-phenethyl-5,6,7,8-tetrahydro-3*H*-quinazolin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6,7,8-tetrahydro-3*H*-quinazolin-4-one;

5-cyclopropyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-3-phenethyl-3,5,6,7-tetrahydro-cyclopentapyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-3,5,6,7-tetrahydro-cyclopentapyrimidin-4-one;

5-ethyl-2-(3-fluoro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(5-fluoro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(2-fluoro-6-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one; and

2-(4-chloro-2-hydroxy-phenyl)-5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one.

14. The compound according to claim 1, wherein the compound is at least one of:

2-(2-hydroxy-phenyl)-5,6-dimethyl-3-phenethyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

3-[2-(4-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6-dimethyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(2-hydroxy-phenyl)-6-methyl-3-phenethyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-3-[2-(4-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-5-propyl-3*H*-pyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5-isopropyl-6-methyl-3*H*-pyrimidin-4-one;

3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5-isopropyl-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-5-methyl-3-phenethyl-6-trifluoromethyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-3-phenethyl-5,6,7,8-tetrahydro-3*H*-quinazolin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-5,6,7,8-tetrahydro-3*H*-quinazolin-4-one;

5-cyclopropyl-3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one;

2-(2-hydroxy-phenyl)-3-phenethyl-3,5,6,7-tetrahydro-cyclopentapyrimidin-4-one;

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-3,5,6,7-tetrahydro-cyclopentapyrimidin-4-one;

5-ethyl-2-(3-fluoro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one;

5-ethyl-2-(5-fluoro-2-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one; and

5-ethyl-2-(2-fluoro-6-hydroxy-phenyl)-3-[2-(3-fluoro-phenyl)-ethyl]-6-methyl-3*H*-pyrimidin-4-one.

15. The compound according to claim 1, wherein the compound is at least one of:

5-ethyl-3-[2-(2-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-3*H*-pyrimidin-4-one; and

3-[2-(3-fluoro-phenyl)-ethyl]-2-(2-hydroxy-phenyl)-6-methyl-5-isopropyl-3*H*-pyrimidin-4-one.

16. A pharmaceutical composition comprising a compound according to claim 1 and a pharmaceutically acceptable diluent or excipient.

17. A method of treating a disease or disorder characterized by abnormal bone or mineral homeostasis which comprises the administration to a subject in need of treatment thereof an effective amount of a compound according to claim 1.

18. A method according to claim 17, wherein the bone or mineral disease or disorder is selected from the group consisting of osteosarcoma, periodontal disease, fracture healing, osteoarthritis, rheumatoid arthritis, Paget's disease, humoral hypercalcemia malignancy, and osteoporosis.

19. A method according to claim 17, wherein the bone or mineral disease or disorder is osteoporosis.

20. A method of increasing serum parathyroid hormone levels in mammals, which comprises the administration to a subject in need of treatment thereof an effective amount of a compound according to claim 1.